MICROENGINE TO NETWORK PROCESSING ENGINE INTERWORKING
FOR NETWORK PROCESSORS
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FIG. 1

FIG. 2

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FIG. 3A

FIG. 3B

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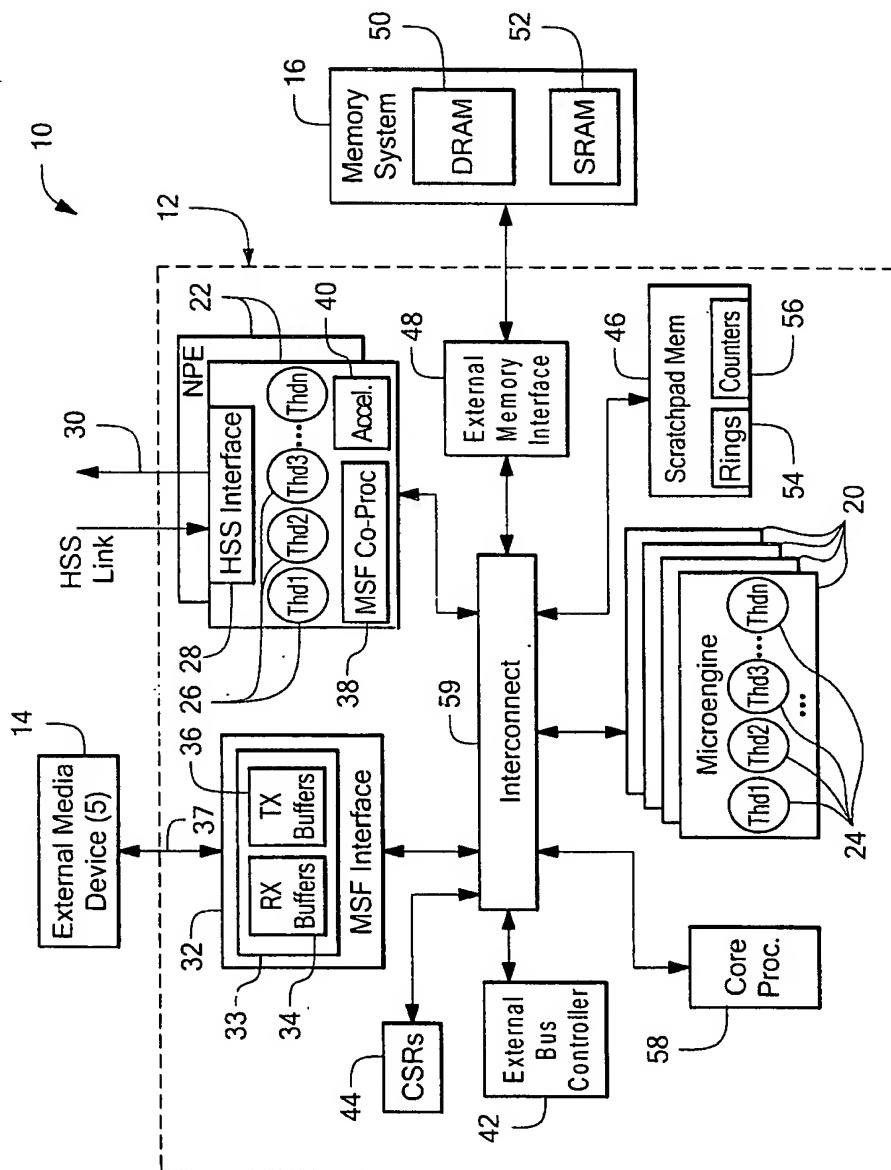Muthu Venkatachalam et al.
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FIG. 4

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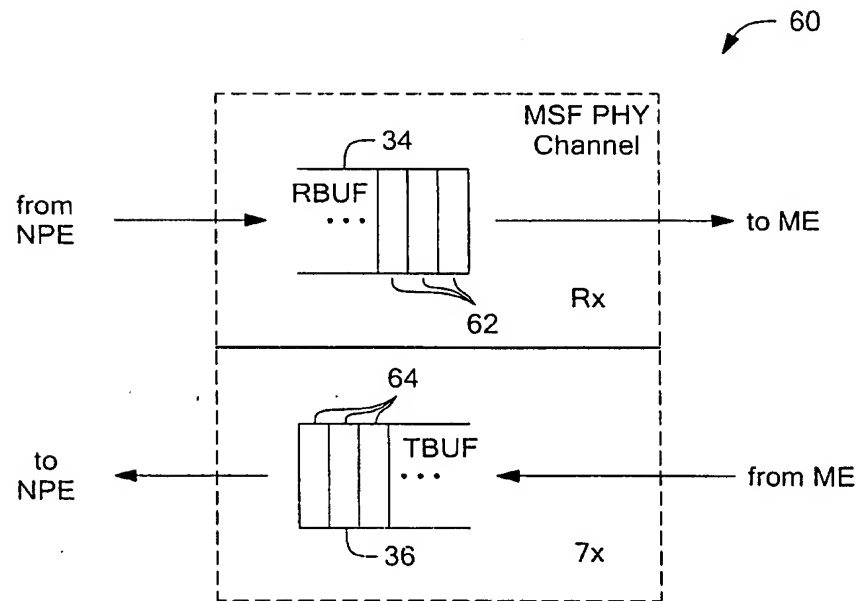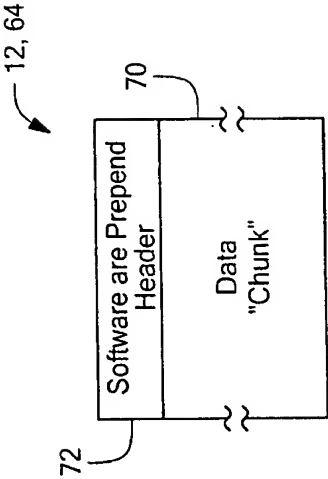Application No. 10/738,407

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```
                                                    120

        ┌──────────────────────┐
        │  NPE receives data for a │  122
        │ channel from line-receive │
        │  hardware (e.g., HSS     │
        │     coprocessor)         │
        └──────────────────────┘
                  │
                  ▼
        ┌──────────────────────┐         ┌──────────────────────────┐
        │  NPE processes and   │  124    │ ME receive driver thread is │
        │ reassembles cell-based│        │  awakened by MSF, and    │
        │   protocol data      │    132  │ thread uses the prepend   │
        └──────────────────────┘         │ header in the RBUF element│
                  │                        │ to process the cell data  │
                  ▼                        │ (also in the RBUF element)│
               ◇ 126                      └──────────────────────────┘
        NO  ◇  Entire  ◇                              │
      ◄─────◇   cell    ◇                             ▼
            ◇ received? ◇             134  ┌──────────────────────────┐
               ◇                           │ Following completion of  │
               │ YES                       │  processing, ME receive  │
               ▼                           │ driver thread goes to sleep│
        ┌──────────────────────┐           │ to await another RBUF    │
        │  NPE composes software│  128     │   element from MSF       │
        │ prepend header, setting all│     └──────────────────────────┘
        │   fields correctly   │
        └──────────────────────┘
                  │
                  ▼
        ┌──────────────────────┐  130
        │  NPE transmits prepend│
        │  header and cell data to│
        │   MSF RBUF element   │
        └──────────────────────┘
```
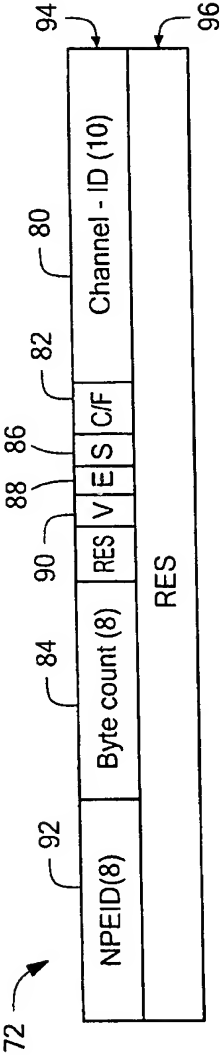
FIG. 5

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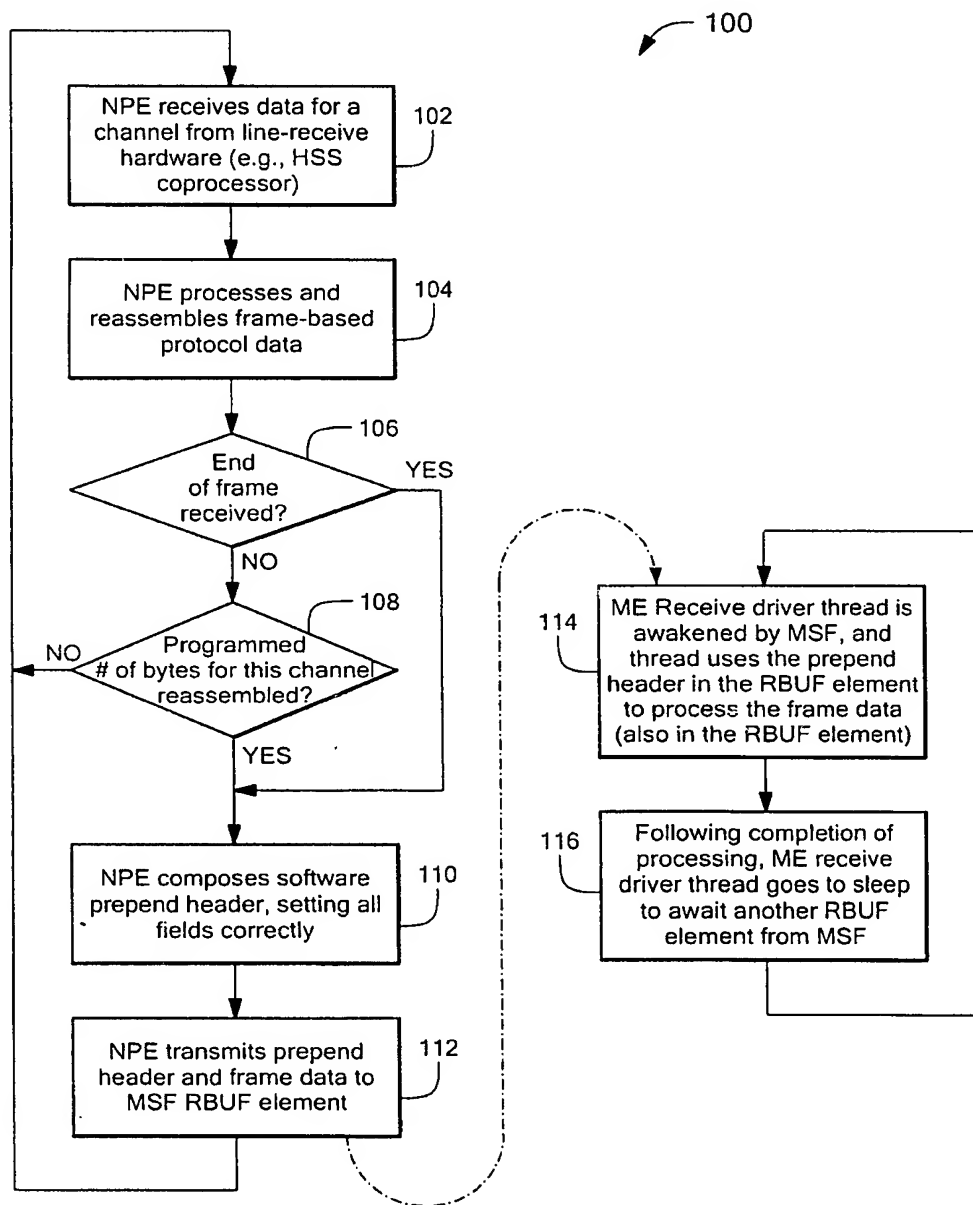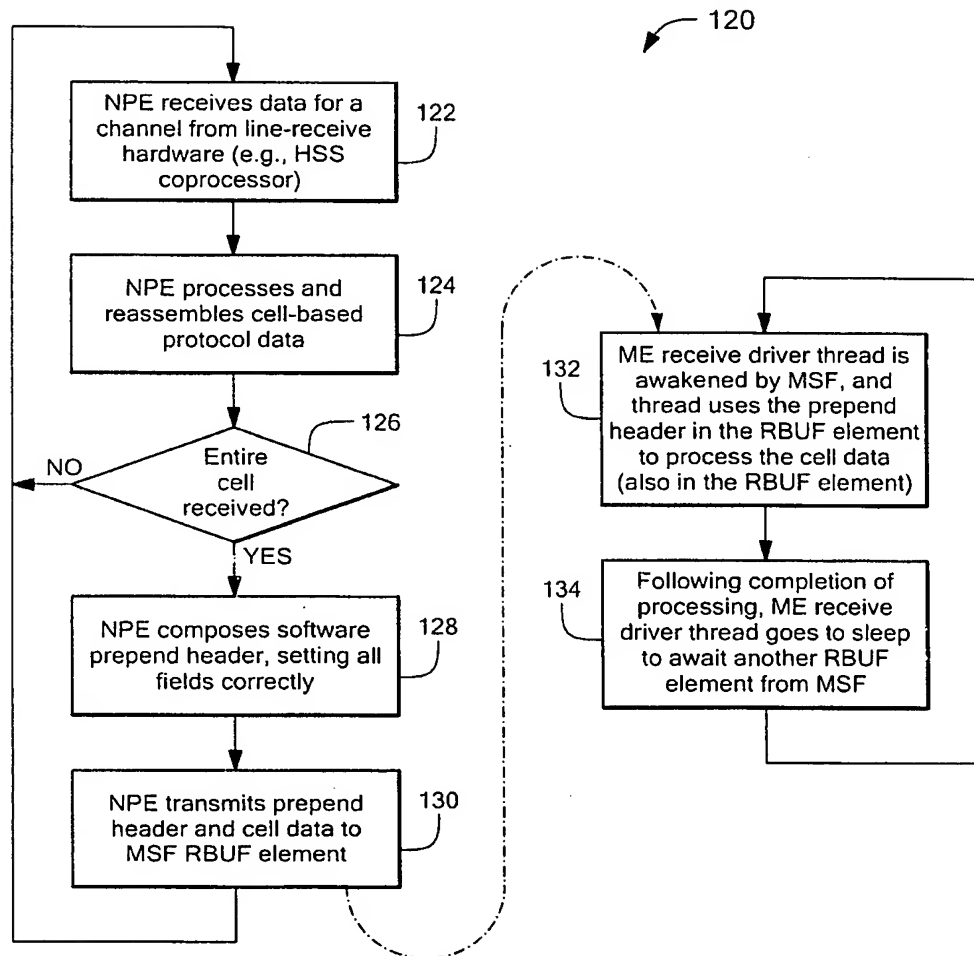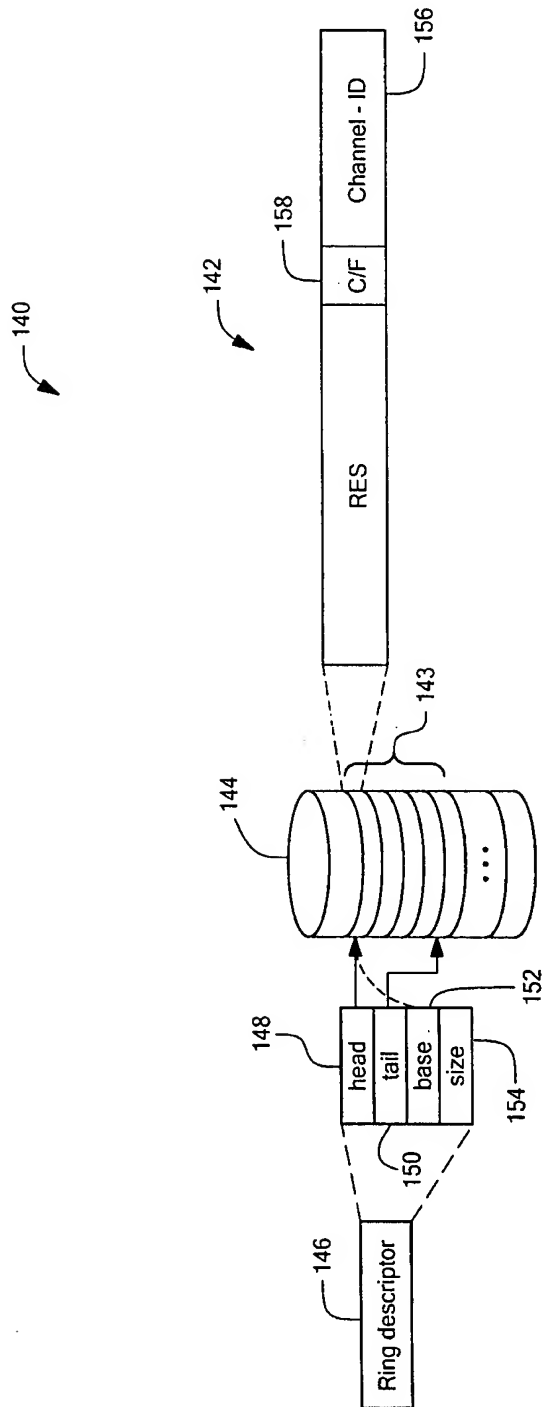Application No. 10/738,407

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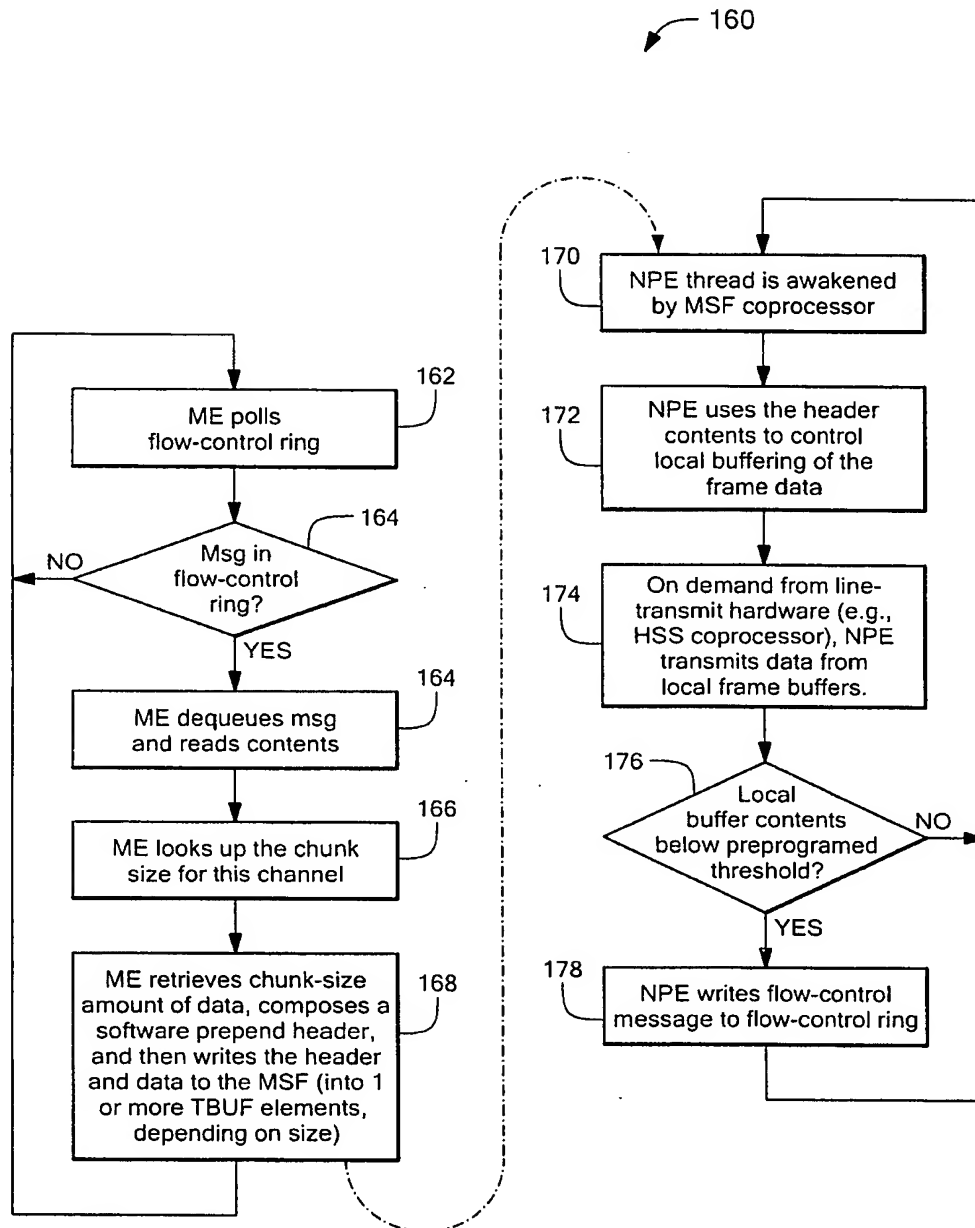
FIG. 6

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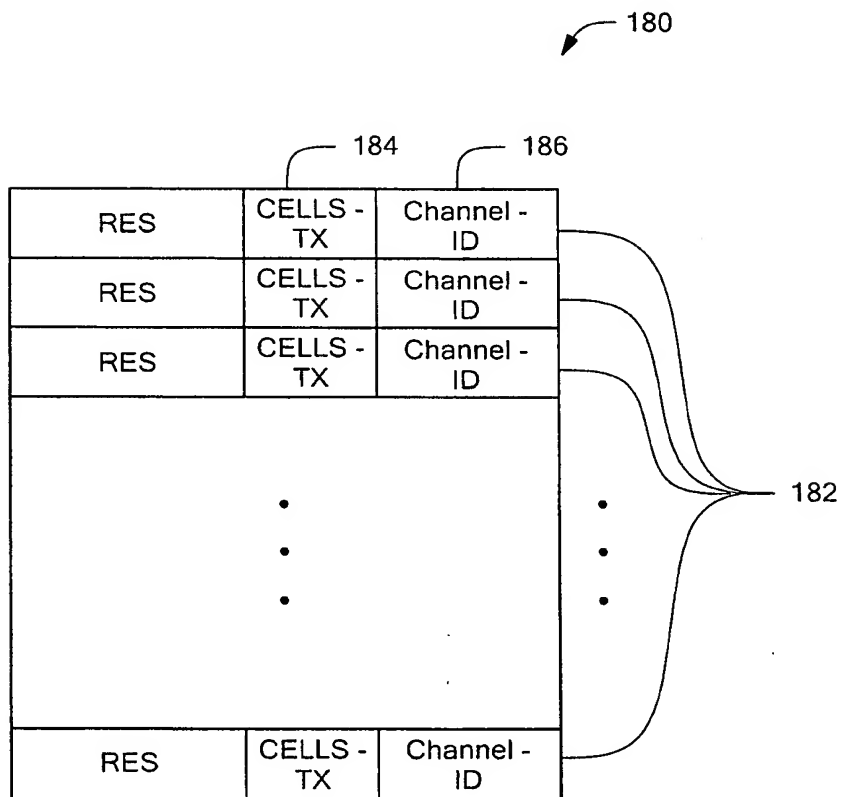160

170 — NPE thread is awakened by MSF coprocessor

172 — NPE uses the header contents to control local buffering of the frame data

174 — On demand from line-transmit hardware (e.g., HSS coprocessor), NPE transmits data from local frame buffers.

176 — Local buffer contents below preprogramed threshold? — NO

YES

178 — NPE writes flow-control message to flow-control ring

162 — ME polls flow-control ring

164 — Msg in flow-control ring? — NO

YES

164 — ME dequeues msg and reads contents

166 — ME looks up the chunk size for this channel

168 — ME retrieves chunk-size amount of data, composes a software prepend header, and then writes the header and data to the MSF (into 1 or more TBUF elements, depending on size)

FIG. 7

180

RES	CELLS - TX	Channel - ID
RES	CELLS - TX	Channel - ID
RES	CELLS - TX	Channel - ID
	• • •	• • •
RES	CELLS - TX	Channel - ID

184   186

182

FIG. 8

┌─ 190

ME polls flow-control location for a channel and computes "cell in flight" ─ 192

"cells in flight" < threshold? ─ 194 — NO

YES

ME retrieves one cell of data, composes a software prepend header, and then writes the header and data to the MSF (into 1 TBUF element) ─ 196

198 ─ **NPE thread is awakened by MSF coprocessor hardware**

200 ─ **NPE uses the header contents to control local buffering of the cell data**

202 ─ **On demand from line-transmit hardware (e.g., HSS coprocessor), NPE transmits cell data from local buffers.**

204 ─ **Has an entire cell been transmitted?** — NO

YES

206 ─ **NPE updates cells-transmitted count and writes the count to flow-control location for this channel**

FIG. 9

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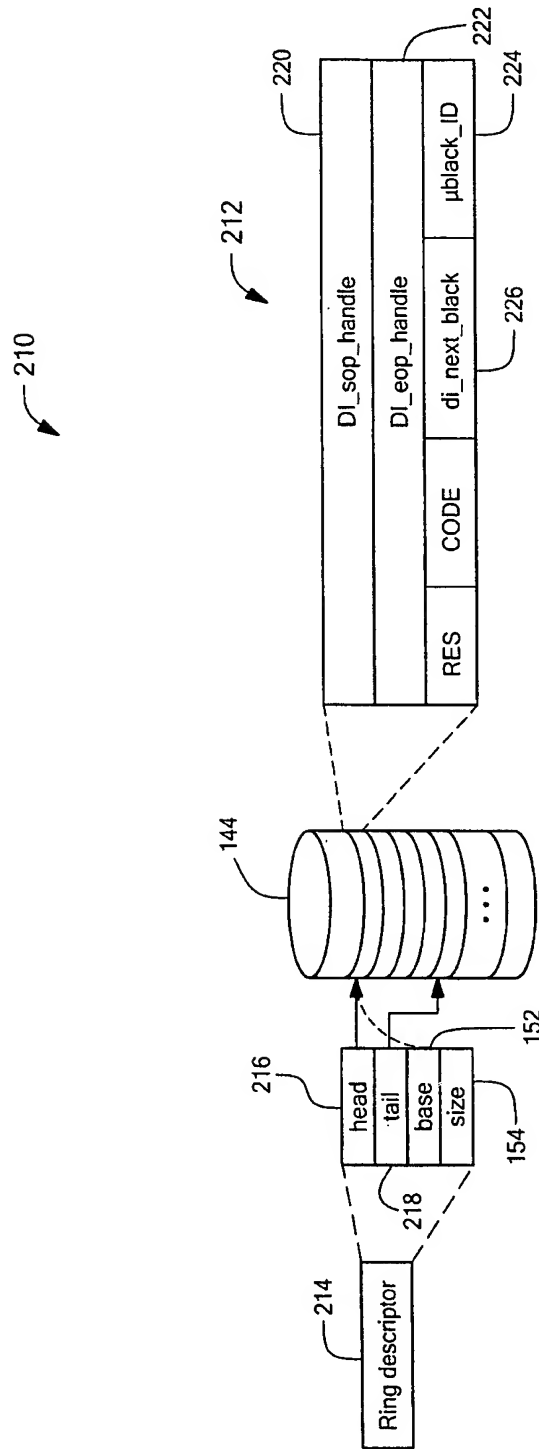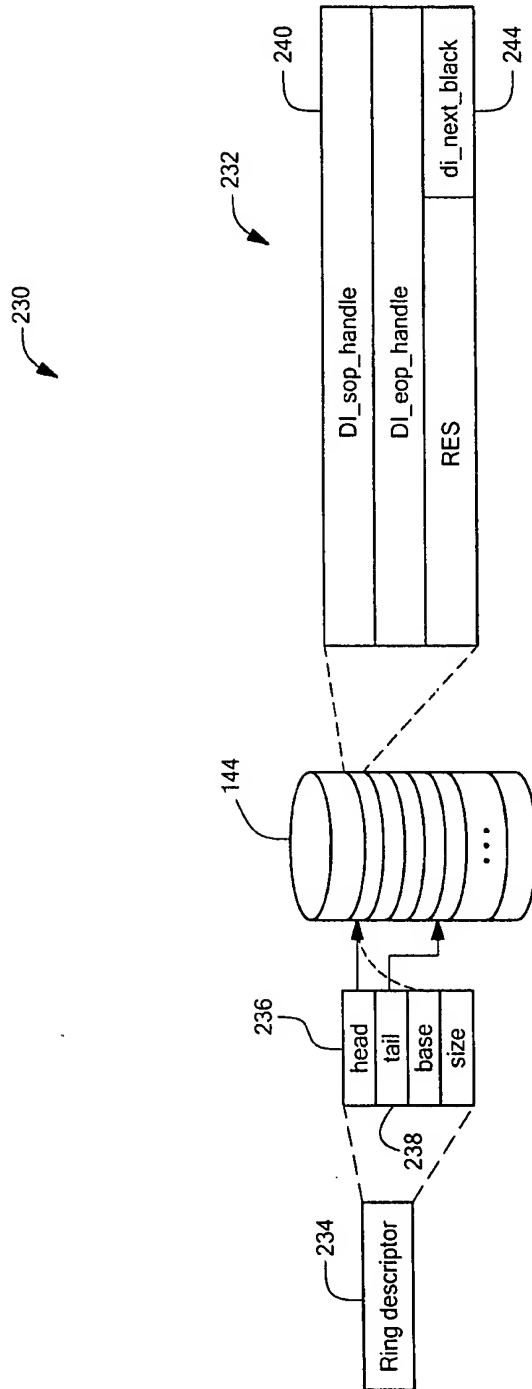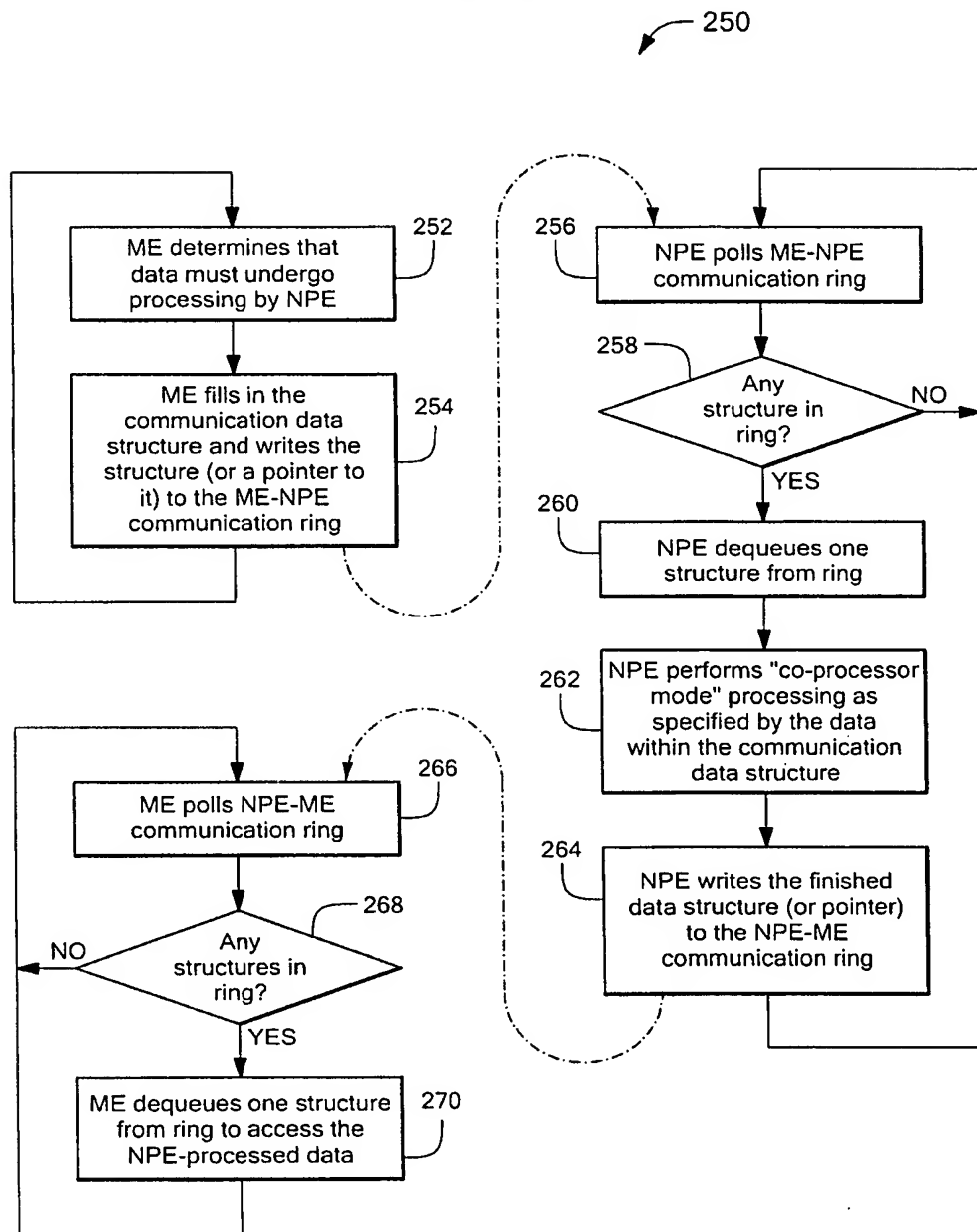Muthu Venkatachalam et al.
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FIG. 10A

FIG. 10B

250

ME determines that data must undergo processing by NPE 252

ME fills in the communication data structure and writes the structure (or a pointer to it) to the ME-NPE communication ring 254

256 NPE polls ME-NPE communication ring

258 Any structure in ring? — NO

YES

260 NPE dequeues one structure from ring

262 NPE performs "co-processor mode" processing as specified by the data within the communication data structure

264 NPE writes the finished data structure (or pointer) to the NPE-ME communication ring

ME polls NPE-ME communication ring 266

268 Any structures in ring? — NO

YES

ME dequeues one structure from ring to access the NPE-processed data 270

FIG. 11

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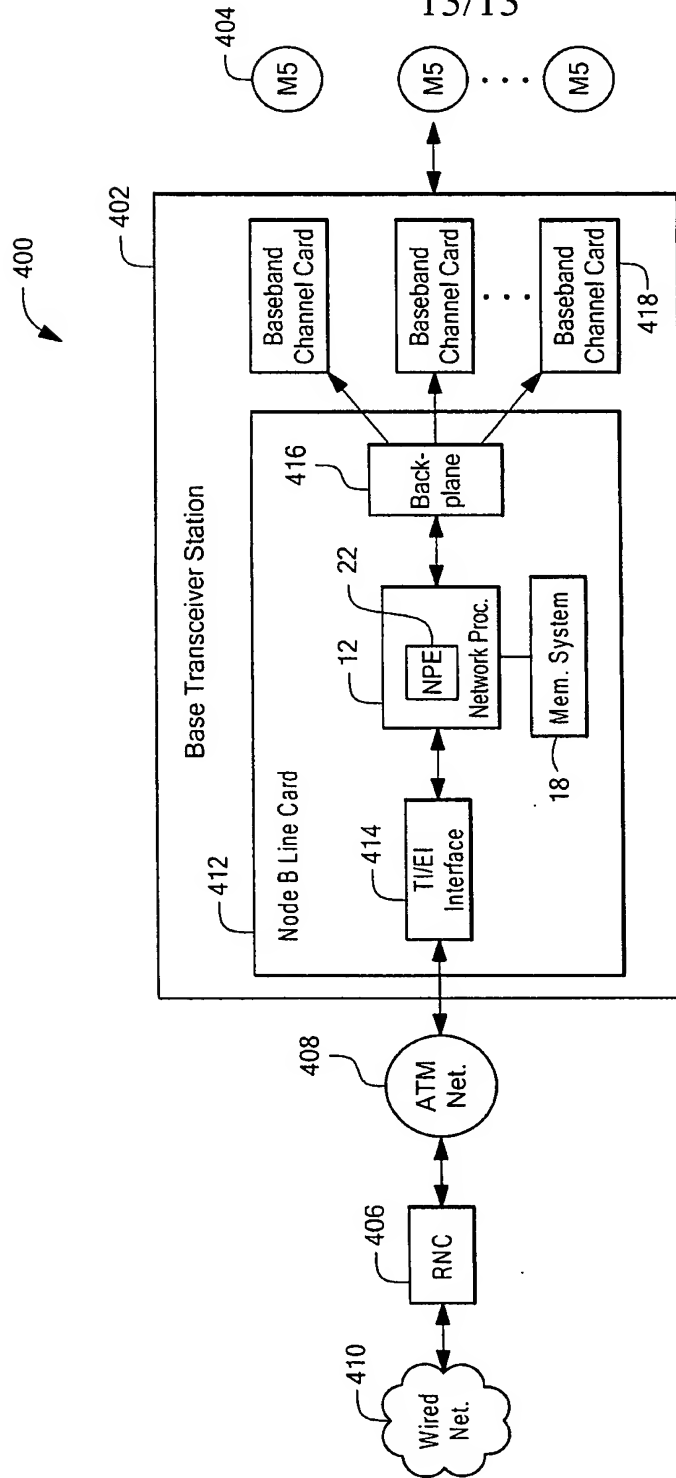Application No. 10/738,407

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FIG. 12